**1998-2005 ENGINE**

**Air Intake, Turbo Charging - 163 Chassis**

# BASIC KNOWLEDGE

### AIR INTAKE, FUNCTION - GF09.00-P-3000A

## ENGINE 112 (except 112.960 /961) without supercharger

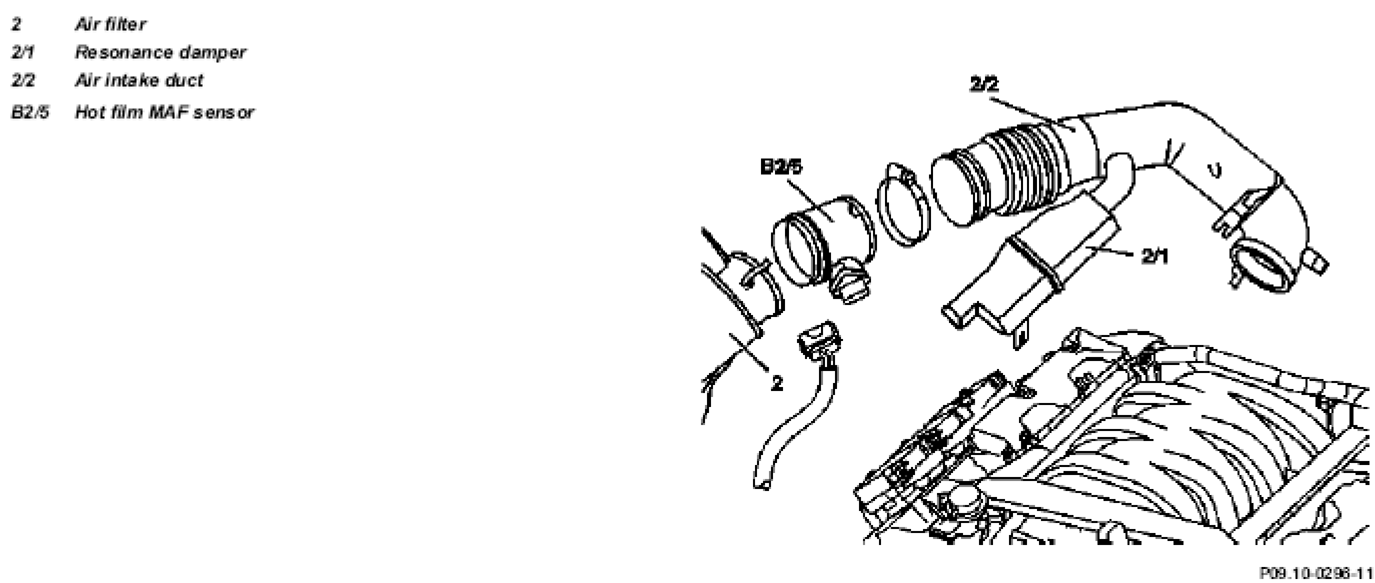



**Fig. 1: Identifying Air Intake Components - Without Supercharger**

| | |
|---|---|
| Purpose | Reducing intake noises |
| Design/function | A Helmholtz resonator (branching filter) with a volume of about 0.6 liters, is installed to reduce the intake noises. This is active in the engine speed range from approx. 3500 - 4500 rpm. As a side effect the air flow in this engine speed range is improved at the hot film mass air flow sensor and the measurement of the air mass is thus more accurate. |

### INTAKE MANIFOLD, LOCATION - GF09.20-P-3102-01A

## Shown on ENGINE 113

12 Variable intake manifold

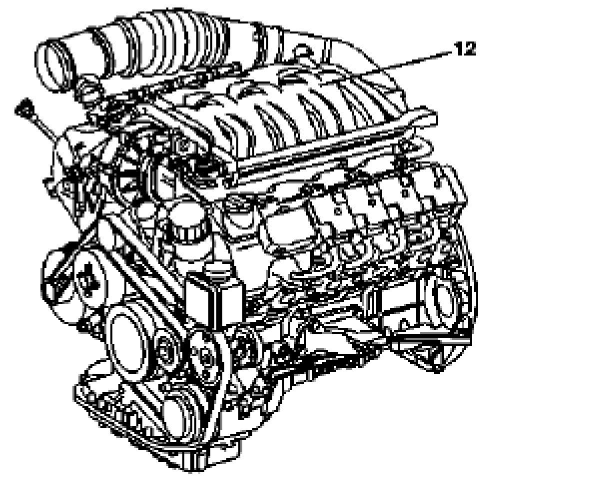



**Fig. 2: Identifying Variable Intake Manifold - Shown On Engine 113**

**INTAKE MANIFOLD, FUNCTION - GF09.20-P-3102-02A**

### Engine 112, 113

### Section through variable intake manifold in cylinder plane

22 Variable flap (one variable flap for each cylinder)
A Intake air when variable flap opened (variable intake manifold switchover valve de-energized)
B Intake air when variable flap closed
C to engine

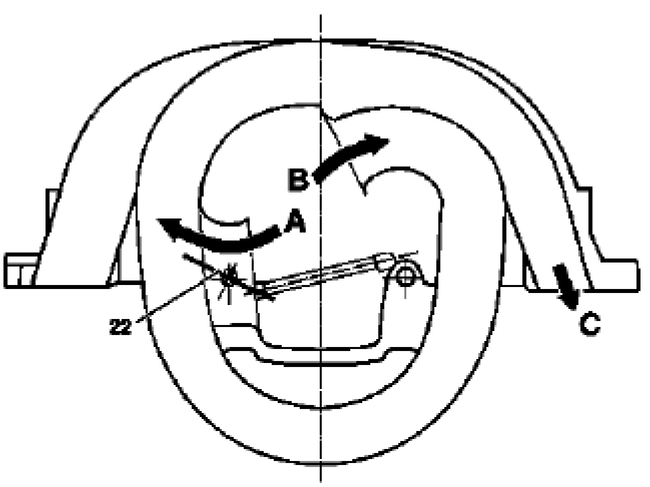



**Fig. 3: Identifying Intake Manifold Function - Section Through Variable Intake Manifold In Cylinder Plane**

When the engine is started and at low engine speeds the variable flaps are open. The intake air flows along the shortest path and thus reaches the cylinder with low friction losses from the distributor volume.

At an engine load of more than 50% from approx. 1750 rpm up to approx. 3900 rpm the variable flaps are

closed. The intake air must flow through the whole intake pipe. Its length is selected in such a way that the pressure waves, produced by the inducting pistons, arrive at the right moment at the open intake valves for the next induction stroke. The result is improved cylinder charge and thus an increase in torque.

At higher engine speeds (e.g. from 3900 rpm) the actuation to the variable intake manifold switchover valve is interrupted - the variable flaps open as a result of the spring force. Through the shortened route the pressure waves arrive in time even at higher rotational speeds before the closing of the intake valves to the combustion chamber.

**INTAKE MANIFOLD, DESIGN - GF09.20-P-3102-03A**

**Shown on ENGINE 112**

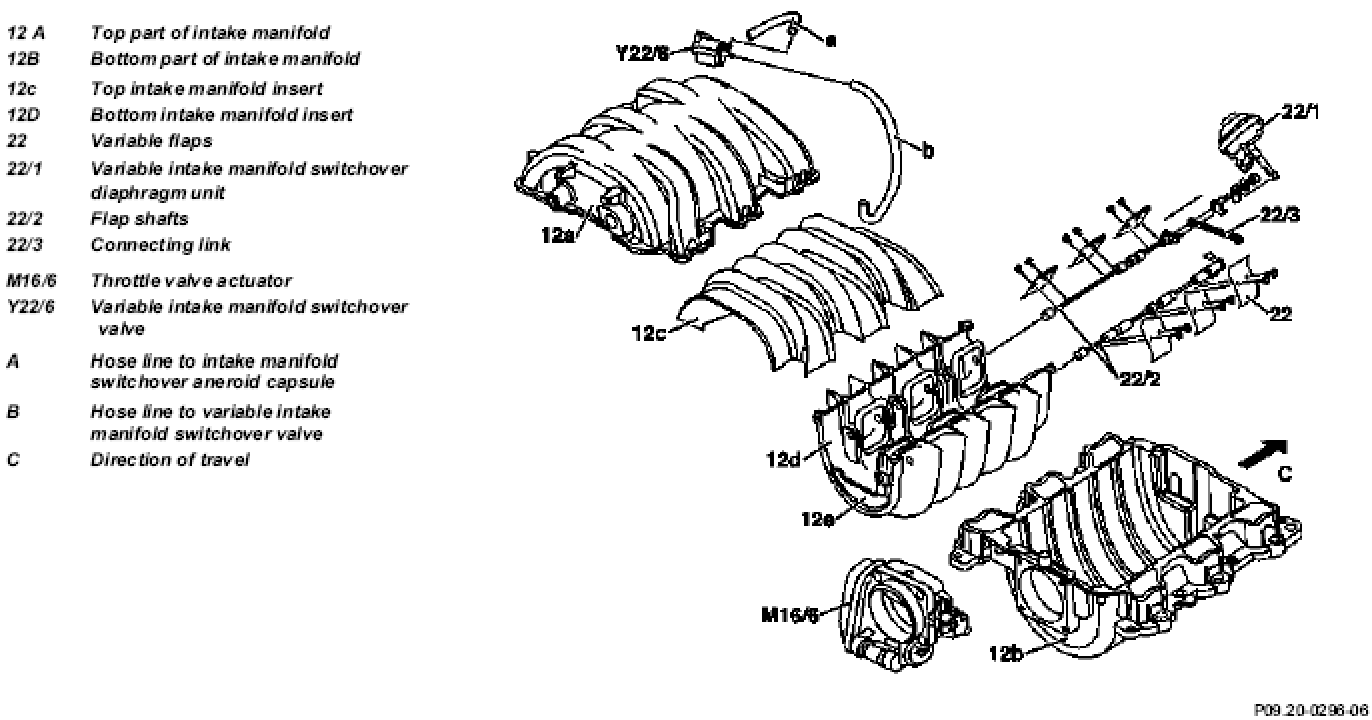



**Fig. 4: Identifying Intake Manifold Components - Shown On Engine 112**

The intake manifold is assembled out of several magnesium pressure castings. When fitted together, they produce the individual intake manifolds and the air collecting volume. The parts are sealed off to each other by plastic. The intake manifold cannot be disassembled.

The individual intake manifolds each approx. 800 mm long, are arranged in a spiral shape around the air collecting volume. A single intake manifold is assigned to each cylinder.

Each single intake manifold has a further opening to the air collecting volume in the middle. These can be opened or closed by means of variable flaps which pivot through approx. 60°.

The variable flaps are attached to steel shafts. One shaft is installed for each bank of cylinders. The

interconnected flap shafts are closed by means of vacuum by the intake manifold switchover diaphragm unit.

When the variable intake manifold switchover valve is open, the vacuum is supplied from a vacuum reservoir with check valve in the intake manifold. The reservoir volume is designed for about 5 operations without renewed evacuation.

The variable flaps open by means of spring force.

**INTAKE MANIFOLD, LOCATION/TASK/DESIGN/FUNCTION - GF09.20-P-3102A**

**ENGINE**
**112.910 /911 /912 /913 /914 /916 /917 /920 /921 /922 /923 /940 /941 /942 /943 /944 /946 /947 /949 /953 /954 /9**

**ENGINE 113.940 /941 /942 /943 /948 /960 /961 /963 /965 /967 /966 /968 /969**

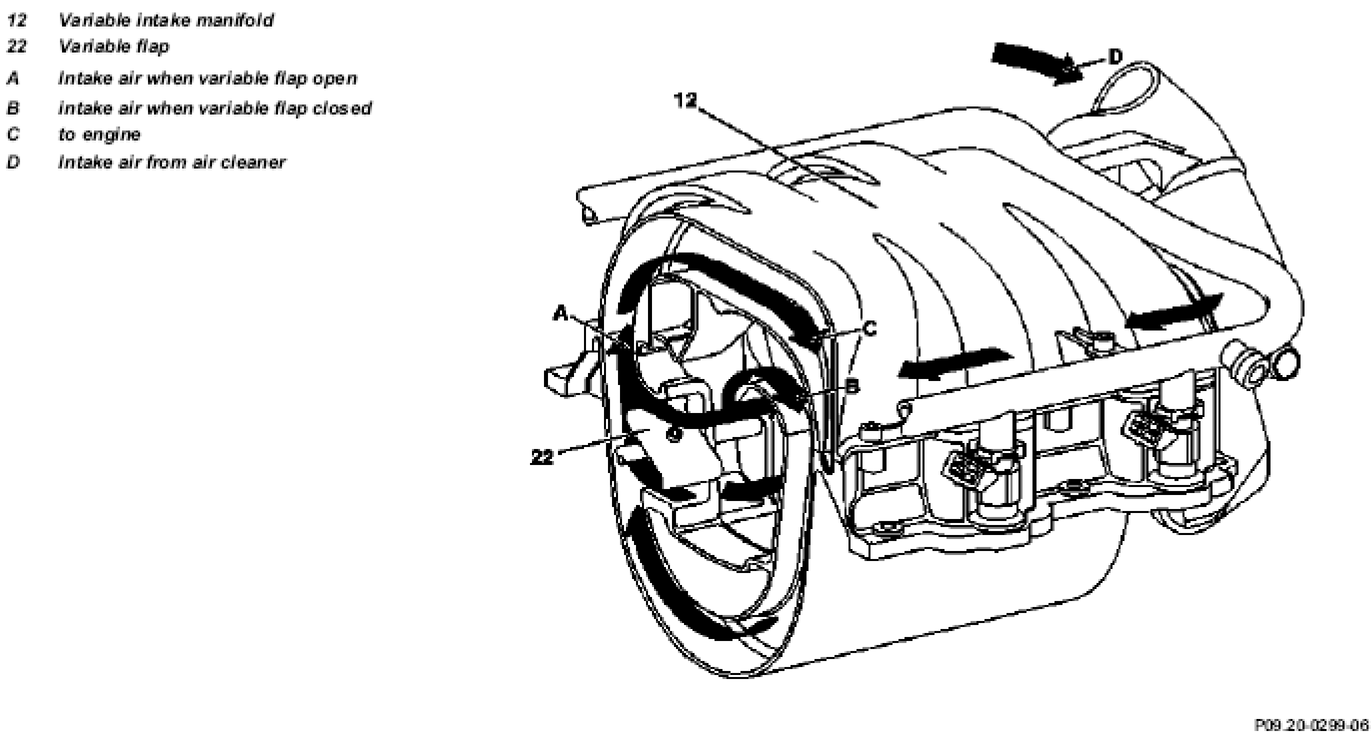


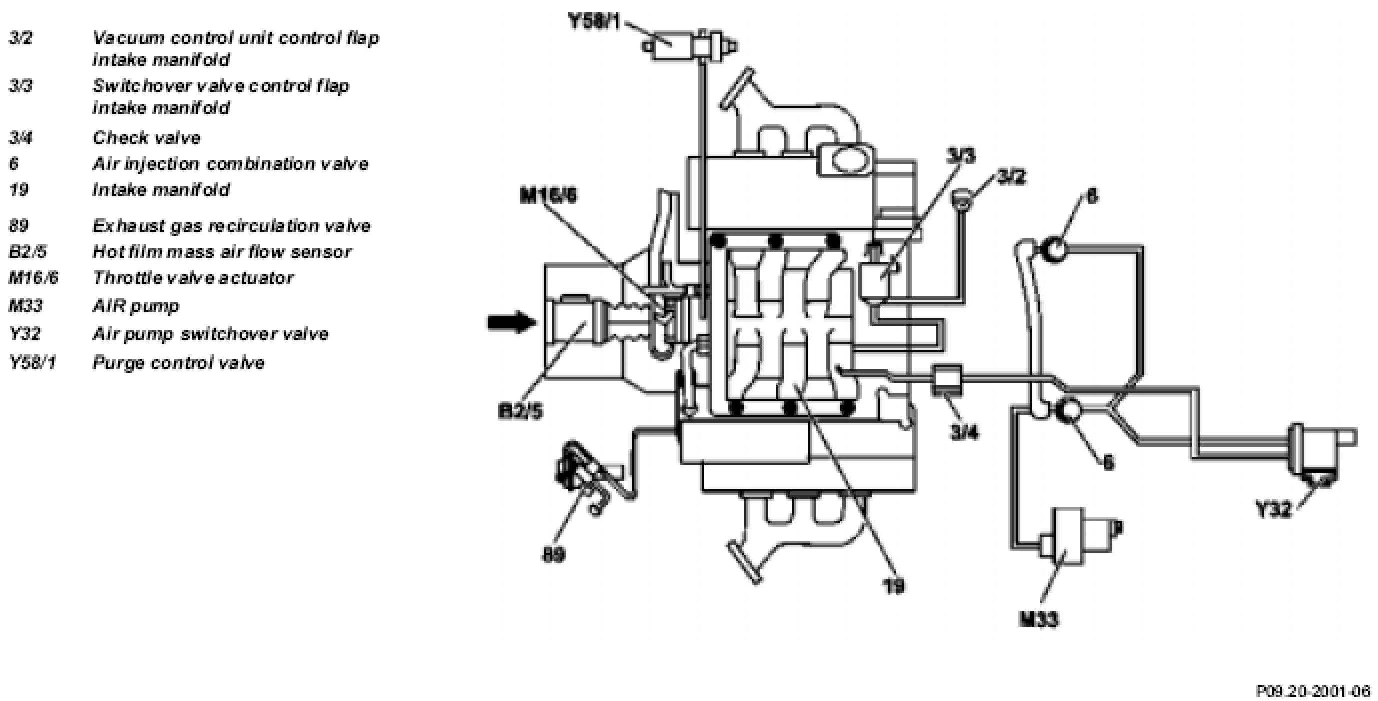

**Fig. 5: Identifying Intake Manifold Design/Function**

| | | | |
|---|---|---|---|
| | Intake manifold, location | | **GF09.20-P-3102-01A** |
| | Intake manifold, task | Optimizing engine torque curve by means of two different intake manifold lengths | |
| | Intake manifold, design | | **GF09.20-P-3102-03A** |
| | Intake manifold, function | | **GF09.20-P-3102-02A** |

## TESTING & REPAIR

**INTAKE MANIFOLD CONNECTION DIAGRAM - AR09.20-P-1310-01A**

### Connection schema intake manifold Engine 112

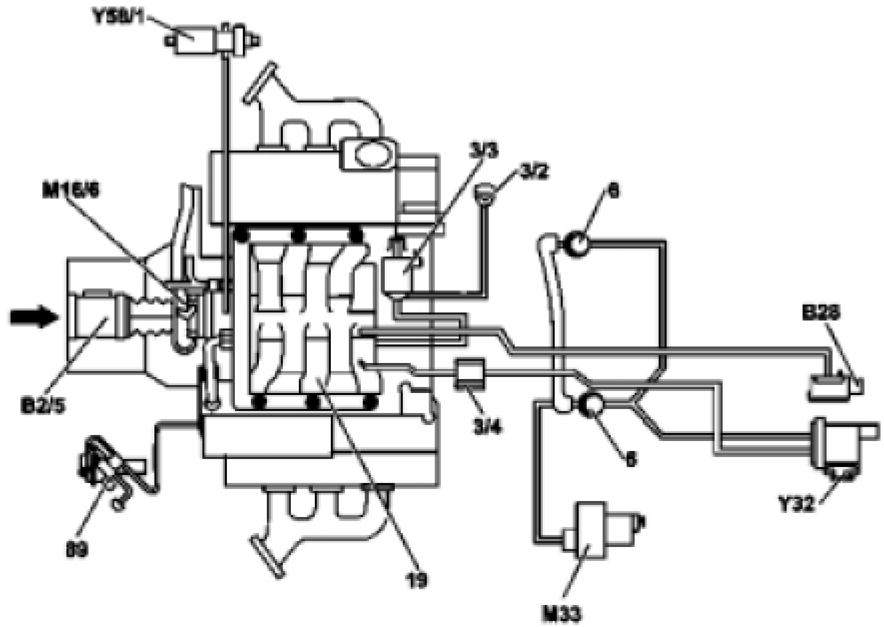



<u>**Fig. 6: Intake Manifold Connection Diagram - Connection Schema Intake Manifold - Engine 112**</u>

**INTAKE MANIFOLD CONNECTION DIAGRAM - AR09.20-P-1310-01AA**

### Connection diagram of intake manifold engine 112 with USA version code 494a

| | |
|---|---|
| *3/2* | *Vacuum control unit control flap intake manifold* |
| *3/3* | *Switchover valve control flap intake manifold* |
| *3/4* | *Check valve* |
| *6* | *Air injection combination valve* |
| *19* | *Intake manifold* |
| *89* | *Exhaust gas recirculation valve* |
| *B2/5* | *Hot film mass air flow sensor* |
| *B28* | *Pressure sensor* |
| *M16/6* | *Throttle valve actuator* |
| *M33* | *AIR pump* |
| *Y32* | *Air pump switchover valve* |
| *Y58/1* | *Purge control valve* |



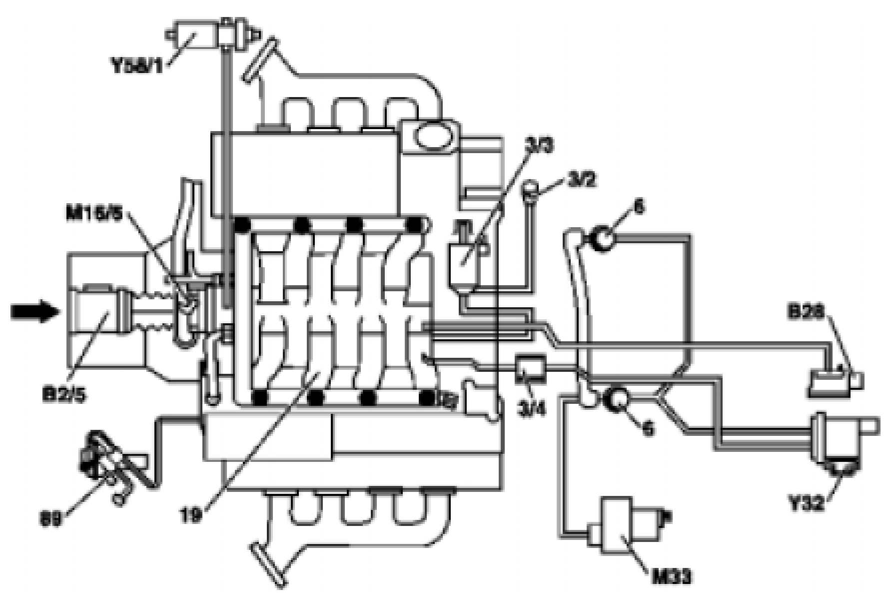

P09.20-2002-06

**Fig. 7: Intake Manifold Connection Diagram - Connection Diagram Of Intake Manifold - Engine 112 With USA Version Code 494a**

**INTAKE MANIFOLD CONNECTION DIAGRAM - AR09.20-P-1310-01AC**

## Shown on engine 113 with USA version code 494a

| | |
|---|---|
| *3/2* | *Vacuum control unit control flap intake manifold* |
| *3/3* | *Control flap switchover valve (intake manifold)* |
| *3/4* | *Check valve* |
| *6* | *Air injection combination valve* |
| *19* | *Intake manifold* |
| *89* | *Exhaust gas recirculation valve* |
| *B2/5* | *Hot film mass air flow sensor* |
| *B28* | *Pressure sensor* |
| *M16/6* | *Throttle valve actuator* |
| *M33* | *AIR pump* |
| *Y32* | *Air pump switchover valve* |
| *Y58/1* | *Purge control valve* |




P09.20-2003-06

**Fig. 8: Intake Manifold Connection Diagram - Shown On Engine 113 With USA Version Code 494a**

**INTAKE MANIFOLD CONNECTION DIAGRAM - AR09.20-P-1310-01AU**

## Shown on engine 113

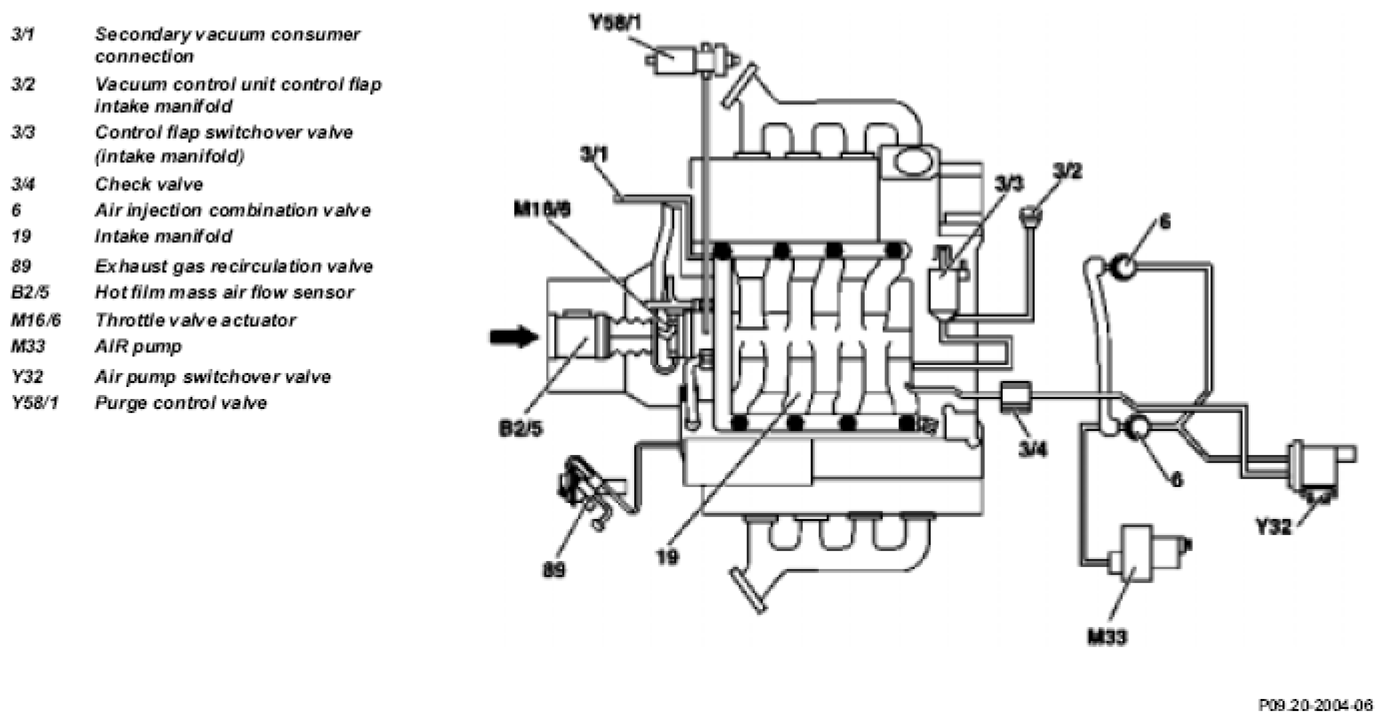



**Fig. 9: Intake Manifold Connection Diagram - Shown On Engine 113**

**REMOVE/INSTALL INTAKE MANIFOLD - AR09.20-P-1310A**

## ENGINE 112.910 in MODEL 202.026/086

## ENGINE 112.920 in MODEL 202.029/089

## ENGINE 112.921 in MODEL 210.063/081 /263 /281

## ENGINE 112.922 in MODEL 220.063/163

## ENGINE 112.923 in MODEL 129.059

## ENGINE 112.940 in MODEL 208.365/465

## ENGINE 112.941 in MODEL 210.065/082/265/282

## ENGINE 112.942 in MODEL 163.154

**ENGINE 112.943 in MODEL 129.064**

**ENGINE 112.944 in MODEL 220.065/165**

**ENGINE 113.940 in MODEL 210.070/270**

**ENGINE 113.941 in MODEL 220.070/170**

**ENGINE 113.960 in MODEL 215.375, 220.075/175**

**ENGINE 113.961 in MODEL 129.068**

**ENGINE 113.944 in MODEL 202.033/093**

**ENGINE 113.942 in MODEL 163.172**

**ENGINE 113.980 in MODEL 210.074/274**

**ENGINE 113.943 in MODEL 208.370/470**

**ENGINE 113.984 in MODEL 208.374**

**ENGINE 113.981 in MODEL 163.174**

**ENGINE 112.912 in MODEL 203.061/261, 209.361 /461**

**ENGINE 112.946 in MODEL 203.064/264**

**ENGINE 112.947 in MODEL 170.465**

**ENGINE 113.963 in MODEL 230.475**

**ENGINE 113.968 in MODEL 209.375/475**

**ENGINE 112.913 in MODEL 211.061/261**

**ENGINE 112.949 in MODEL 211.065/265**

**ENGINE 113.967 in MODEL 211.070/270**

**ENGINE 113.987 in MODEL 209.376/476**

**ENGINE 112.955 in MODEL 209.365/465**

**ENGINE 112.916 in MODEL 203.081/281**

**ENGINE 112.953 in MODEL 203.084/284**

**ENGINE 112.970 in MODEL 163.157**

**ENGINE 112.972 in MODEL 220.067/167**

**ENGINE 112.973 in MODEL 230.467**

**ENGINE 113.965 in MODEL 163.175**

**ENGINE 112.975 in MODEL 220.087/187**

**ENGINE 113.948 in MODEL 220.083/183**

**ENGINE 113.966 in MODEL 220.084/184**

**ENGINE 112.917 in MODEL 211.080/280**

**ENGINE 112.954 in MODEL 211.082/282**

**ENGINE 113.969 in MODEL 211.083/283**

**ENGINE 113.988 in MODEL 203.076/276**

**ENGINE 113.989 in MODEL 171.473**

**Shown on engine 112**

2/1 Cylinder head cover bolt
6 Combination valve
17/2 Feed line
19 Intake manifold
19/1 Bolt
19/3 Seal
89 Exhaust gas recirculation valve
89/2 Line
Arrow: Hole for combination valve

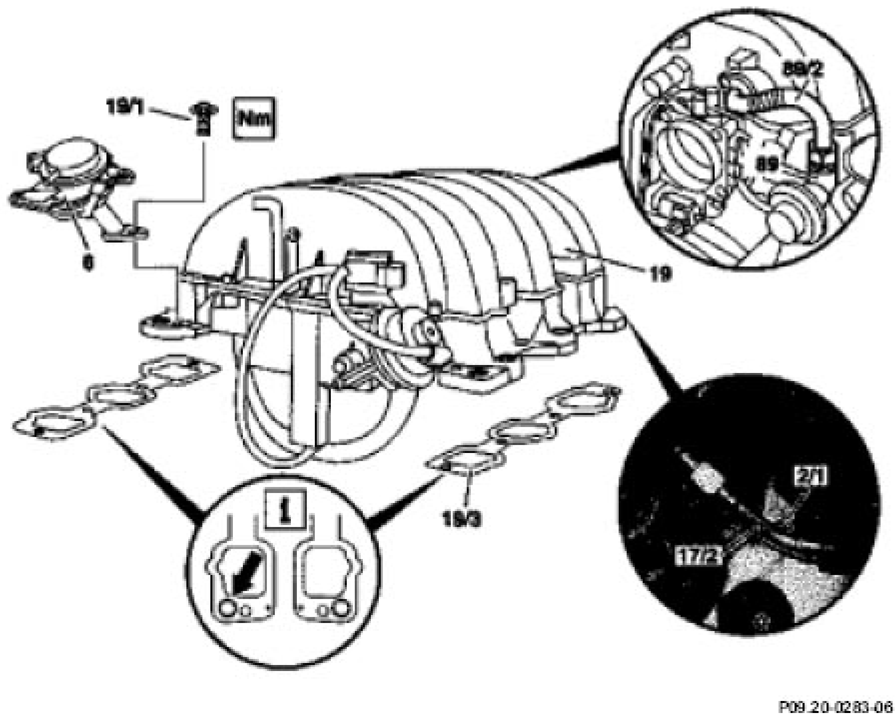



**Fig. 10: Identifying Intake Manifold Remove/Install Components - Shown On Engine 112**

2 Crankcase ventilation hose
89/2 Line

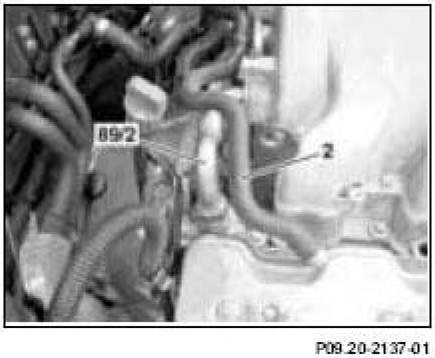



**Fig. 11: Identifying Crankcase Ventilation Hose And Line**

| | **Remove/install** | | |
|---|---|---|---|
| ⚠ Danger! | **Risk of explosion** caused by fuel igniting, **risk of poisoning** caused by inhaling and swallowing fuel and **risk of injury** to eyes | No fire, sparks, open flames or smoking.<br>Only pour fuels into suitable and appropriately marked containers.<br>Wear protective clothing when handling fuel. | AS47.00-Z-0001-01A |

| | | | |
|---|---|---|---|
| | and skin caused by contact with fuel | | |
| 1 | Remove key from electronic ignition switch | Only on vehicles with electronic ignition switch.<br>[i] Vehicles with Keyless Go code 889: Switch off engine, remove Keyless Go-Cards out of vehicle and store outside of the sender range. | |
| 2 | Remove cover on front side of engine | Model 129, 211, 215, 220, 230 only | |
| 3.1 | Remove engine cover with integrated air filter | Except model 171.473, 203.076 /276, , 209.376 /476 from 24.4.04<br>[i] The air filter is integrated in the engine cover. Remove engine cover or air filter by pulling it vertically up and off the cylinder head covers. | |
| 3.2 | Remove air filter housing | Model 171.473<br>Model 203.076/ 276<br>Model 209.376/ 476 as of 24.4.04 | AR09.10-<br>P-1150A( |
| 4 | Remove hot film mass air flow sensor with air intake pipe | Engine 112.910/ 920/ 921/940/ 941/ 942/ 970<br>Engine 113.940 | **AR07.07-**<br>**P-1454A** |
| | | Engine 112.922 /944 /972 /973 /975<br>Engine 113.941/ 948/ 960/ 961/ 963/ 966 | AR07.07-<br>P-1454A. |
| | | Engine 112.912 /913 /916 /917 /946 /947 /949 /954 /953 /955<br>Engine 113.968 /967 /969 /987 /988 /989 | AR07.07-<br>P-1454S\ |
| | | Engine 112.923 /943<br>Engine 113.943 /944 /980 /984 | AR07.07-<br>P-1454A( |
| | | Engine 113.942 /965/981 | **AR07.07-**<br>**P-1454MV** |
| 5 | Disconnect lead line (17/2) at the fuel distributor | [i] Release fuel pressure via service valve and collect fuel. | |
| | | [Nm] | ***BA07.5:**<br>**P-1001-01A** |
| | | [tool] | **Fig. 12** |
| 6 | Removing fuel rail with injection valves | Engine 112.910 /920 /921 /923 /940 /941 /942 /943 /970<br>Engine 113.940 /942 /943 /944 /961 /965 /980 /981 /984 | **AR07.03-**<br>**P-1451A** |
| | | Engine 112.912/913 /916 /917 /922 /944 /946 /947 /949 /953 /954 /955 /972 /973 /975<br>Engine 113.941 /948 /960 /963 /966 /967 /968 /969 /987 /988 /989 | AR07.03-<br>P-1451A. |
| | Unscrew | | |

| | | | |
|---|---|---|---|
| 7.1 | cylinder head cover (2/1) bolt | Model 230.475 only<br>Nm | ***BA01.2(<br>P-1001-<br>01E** |
| 7.2 | Remove crankshaft ventilation hose (2) and line (89/2) and place to one side | Model 171.473 only<br>i Remove cylinder head cover (2/1) bolt in order to detach exhaust gas recirculation valve (89) bracket.<br>Nm | ***BA01.2(<br>P-1001-<br>01E** |
| 8 | Disconnect vacuum lines from intake pipe (19) | i **Installation:** Observe intake manifold connection diagram. ?<br>Engine 112 except 112.913 /917 /949 /954<br>Engine 112.913/917 /949 /954<br>Engine 112 with USA version, code 494, except engine 112.913 /916 /917 /949 /953 /954 /975<br>Engine 112.913/916 /917 /949 /953 /954 /975 with USA version, code 494<br>Engine 113 except 113.967 /969<br>Engine 113.967/969<br>Engine 113 with USA version, code 494, except engine 113.948 /963 /966 /984 /967 /969 /989 /988<br>Engine 113.948 /963 /966 /984 /967 /969 /988 /989 with USA version, code 494 | **AR09.20-<br>P-1310-<br>01A**<br>AR09.20-<br>P-1310-<br>01T<br>**AR09.20-<br>P-1310-<br>01AA**<br>**AR09.20-<br>P-1310-<br>01AU**<br>AR09.20-<br>P-1310-<br>01TA<br>**AR09.20-<br>P-1310-<br>01AC** |
| 9 | Disconnect electrical connectors | | |
| 10 | Unscrew acorn nut from pipe (89/2) to exhaust gas recirculation | i Counterhold connection fitting when unscrewing. | |

| | | | |
|---|---|---|---|
| | valve (89) | Nm | ***BA14.2 P-1002-01B** |
| 11 | Unscrew screw (19/1) | Except engine 113.987 as of 24.04.04,<br>Engine 113.988/989<br>Nm | ***BA09.2 P-1001-01D** |
| 11.2 | Remove bolts from right combination valve (6) and left combination valve (6) | Only with engine 113.987 as of 24.04.04<br>Engine 113.988/989<br>Nm | ***BA09.2 P-1001-01D** |
| 12.1 | Remove combination valve (6) | Except engine 113.987 as of 24.04.04<br>Engine 113.988/989<br>i **Installation:** Install new gasket | |
| 12.2 | Loosen right combination valve (6) and left combination valve (6) and place to one side | Only engine 113.987 from 24.04.04<br>Engine 113.988/989<br>i **Installation:** Replace the gaskets. | |
| 13 | Dismount intake manifold (19) | i Plug intake ducts. Use centering bolt for exact positioning of intake manifold and for centering the gasket (19/3).<br>Nm | ***BA09.2 P-1001-01D**<br>**Fig. 13** |
| 14 | Replace gasket (19/3) | | |
| 15 | Install in the reverse order | | |

### Nm Crankcase ventilation, cylinder head cover

| Number | Designation | Engine 113.940/941/942/943/944/948/960/961/962/963/964/965/966/967/968/969/971/980/981/ |
|---|---|---|

| | | |
|---|---|---|
| BA01.20-P-1001-01E | Cylinder head cover bolt Nm | 10 |

### Fuel distributor

| Number | Designation | | Engine 112 except 112.945/951/960/961 |
|---|---|---|---|
| BA07.52-P-1001-01A | Fuel feed line to fuel distributor | Nm | 38 |

### Fuel distributor

| Number | Designation | | Engine113.987 | Engine113.940/941/942/943/944/945/946/948/960/961/962/9 |
|---|---|---|---|---|
| BA07.52-P-1001-01A | Fuel feed line to fuel distributor | Nm | 38 | 38 |

### Intake manifold

| Number | Designation | | | Engine112,113 |
|---|---|---|---|---|
| BA09.20-P-1001-01D | Bolt, intake manifold to cylinder head | M8 | Nm | 20 |

### Exhaust gas recirculation

| Number | Designation | | Engine 112.910/912/916/920/921/922/923/940/941/942/943/944/945/946/947/953/ |
|---|---|---|---|
| BA14.20-P-1002-01B | Union nut, exhaust gas recirculation pipe to exhaust gas recirculation valve | Nm | 40 |

### Exhaust gas recirculation

| Number | Designation | | Engine113.989 |
|---|---|---|---|
| BA14.20-P-1002-01B | Union nut, exhaust gas recirculation pipe to exhaust gas recirculation valve | Nm | 40 |

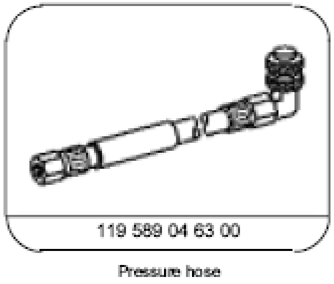



**Fig. 12: Identifying Pressure Hose (119 589 04 63 00)**

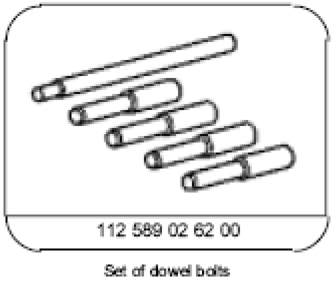



**Fig. 13: Identifying Set Of Dowel Bolts (112 589 02 62 00)**